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INTERMOUNTAIN STATION
Central Reference File
No. 3.4143-12

NOV 15 1955
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PINE BUTTERFLY CONTROL

SOUTHWEST IDAHO

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

BOISE NATIONAL FOREST
IDAHO

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MISSOULA
FOREST INSECT
LABORATORY

PINE BUTTERFLY CONTROL PROJECT REPORT

1954

BOISE NATIONAL FOREST

ADMINISTRATION BY BOISE NATIONAL FOREST, INTERMOUNTAIN REGION

TECHNICAL GUIDANCE BY
INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

with cooperation from

SOUTHERN IDAHO FORESTRY ASSOCIATION
AGRICULTURAL RESEARCH SERVICE
CIVIL AERONAUTICS AUTHORITY
U. S. WEATHER BUREAU
IDAHO DEPARTMENT OF AERONAUTICS
PACIFIC NORTHWEST REGION, FOREST SERVICE
STATE OF IDAHO DEPARTMENT OF FORESTRY
SOUTHERN IDAHO TIMBER PROTECTIVE ASSOCIATION
KEEP IDAHO GREEN COMMITTEE

(AGRICULTURE - OGDEN)

FOREWORD

The successful aerial control of a serious infestation of pine butterfly on some 250,000 acres of valuable ponderosa pine timber in southwest Idaho is another milestone in insect control work.

Insect control progress was advanced through extending the aerial spraying to another forest insect for the first time and through new achievements in economy and safety.

Although the area treated was primarily Federal lands and the spraying operation accomplished entirely by Federal funds, much credit for the success of the job can be given private industry, State of Idaho and many other cooperating agencies and individuals.

Spraying contractors and their personnel were skilled, well trained, and cooperated in every manner possible to accomplish a good spraying job.

The report which follows outlines major features of the control operation.

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INTRODUCTION

Extensive areas of merchantable ponderosa pine timber located in Boise, Valley and Elmore counties in southwest Idaho on the Boise National Forest were seriously infested by the pine butterfly, *Neophasia menapia*, during the summer of 1953.

The values at stake were estimated at a half a billion dollars in sale value of the timber to the Government, in jobs provided by the local timber industry which is of major importance to the economy of the area and in the market value of the timber products to be supplied by these ponderosa pine forests. There are about 1.6 billion board feet of timber within the area of heaviest infestation. The watershed value, scenic beauty, recreational opportunities and wildlife habitat saved by the project are intangible benefits of incalculable worth.

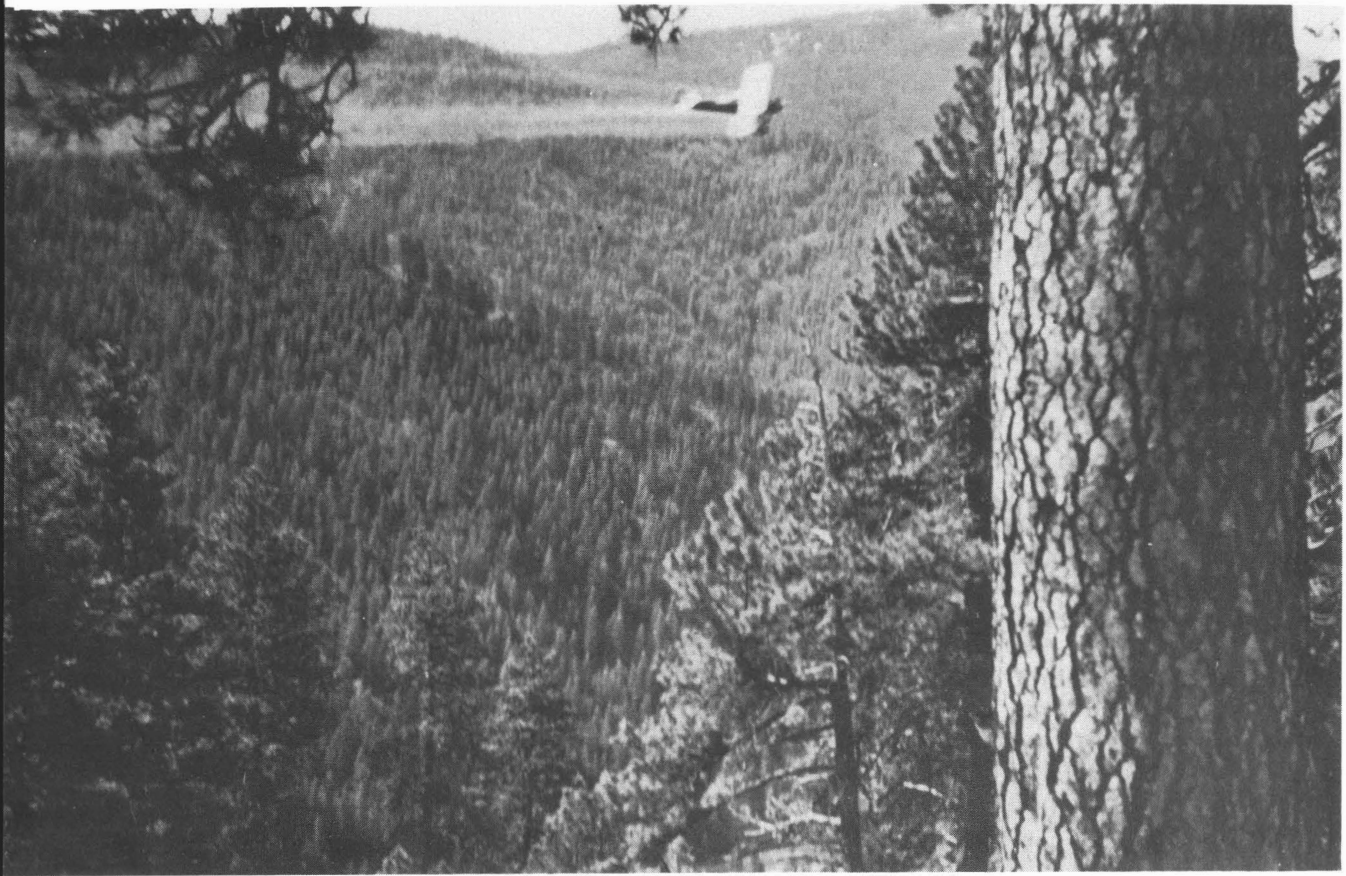
The feasibility of exterminating this threat to the valuable ponderosa pine stands of the Boise National Forest was tried experimentally and successfully on a 400-acre block of heavily infested timber on July 18, 1953 and plans were immediately laid to stop the epidemic.

Representatives of the local timber industries, the State of Idaho Department of Forestry, the Keep Idaho Green Committee, the Southern Idaho Forest Protective Association and other land-owning or managing and conservation agencies cooperated wholeheartedly with the Forest Service, aided with surveys, provided information and contributed valuable assistance to help plan and initiate a control job. They made a major contribution to its success.

A detailed report of the situation was prepared in cooperation with the agencies listed above and the Forest Service recommended an extensive control program for 1954. Funds were provided for the project and this report gives a summary of the steps taken in the planning, organization and execution of the control job.

This project, the first and only one of its kind directed at the pine butterfly, began June 7, 1954, under the administration of the Boise National Forest and was completed on July 7.

The control job was successful and was accomplished at a lower cost than had been originally estimated.



View of Deadwood River drainage showing type of areas covered by spraying project and the timber, scenic and watershed values involved.

Funds for control were appropriated by Congress under authorization of the Forest Pest Control Act.

STATISTICAL SUMMARY

Total Cost of Project		$ 224,760.66
Total Acreage		255,403
Total Cost Per Acre		$ 0.88
Total Man Days		
Government	904	
Contract	454	1,358
Total Gallons Insecticide		244,587
Total Airplane Hours		316 hrs., 03 min.
Lost Time Accidents		None

ORGANIZATION

As soon as word was received that the project had been given favorable consideration and funds would be made available, a project director was selected and plans for control were well underway by January of 1954. After a careful appraisal of the infested areas a division into two control units appeared to be the most practical and economical method of attack, each one to be treated individually. (See Control Map.)

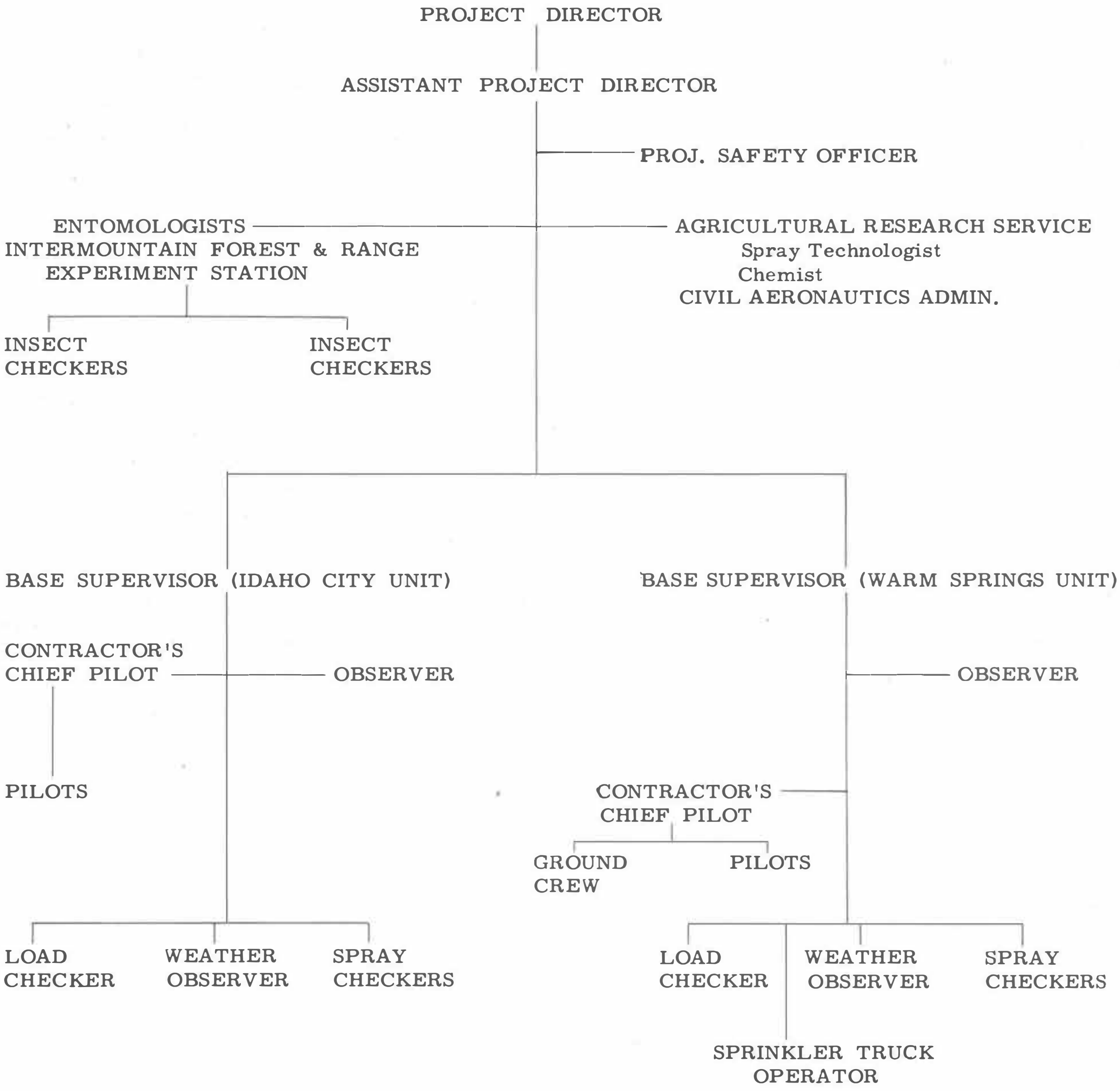
Time for completion of spraying was limited because larvae feeding lasts only 6 to 8 weeks during the period from early June to late July. Therefore, it was necessary to gear the entire control project to this relatively short and rather unpredictable period in the life of the insect. In fact, to prevent the excessive damage which would occur during the last three larval instars it was most desirable to complete control in a three, or at most, a four-week period.

Weather determines the time when hatching begins. Therefore, actual dates for spraying could be only approximately set. This factor governed supply dates in all three contracts for delivery of insecticide, transportation of the insecticide and spraying. In fact, every phase of the project hinged directly upon larval hatching and development. For this reason it was important to lay the plans so that the control organization could be swung into full-geared operation within less than a week after notice of larval activity. Sound entomological knowledge and advice proved essential to success not only in the planning phases but throughout the operation. A Project Entomologist of the Intermountain Forest and Range Experiment Station and his crew maintained vigilant watch of larval development and provided continuous information on the order in which areas were to be sprayed. They later checked closely on spray deposit patterns and larval mortality to insure complete coverage and thorough kill of the insects of each area as it was treated.

Detailed plans were prepared and project personnel carefully selected to fit particular jobs in the organization based on their previous experience and accomplishment.

Following is a chart of the operating organization:

OPERATING ORGANIZATION


PROJECT DIRECTOR
ASSISTANT PROJECT DIRECTOR
PROJ. SAFETY OFFICER
ENTOMOLOGISTS
INTERMOUNTAIN FOREST & RANGE
EXPERIMENT STATION
AGRICULTURAL RESEARCH SERVICE
Spray Technologist
Chemist
CIVIL AERONAUTICS ADMIN.
INSECT
CHECKERS
INSECT
CHECKERS
BASE SUPERVISOR (IDAHO CITY UNIT)
BASE SUPERVISOR (WARM SPRINGS UNIT)
CONTRACTOR'S
CHIEF PILOT
OBSERVER
OBSERVER
PILOTS
CONTRACTOR'S
CHIEF PILOT
GROUND
CREW
PILOTS
LOAD
CHECKER
WEATHER
OBSERVER
SPRAY
CHECKERS
LOAD
CHECKER
WEATHER
OBSERVER
SPRAY
CHECKERS
SPRINKLER TRUCK
OPERATOR

All spray aircraft and personnel for their operation and maintenance were provided by the contractors for each unit.

Personnel included chief pilot, ground supervisor, licensed commercial pilot for each plane and two licensed A and E mechanics at each base.

PLANS

Detailed information and plans, including duties and responsibilities for each of the project personnel were compiled by the project director about a month prior to a two-day training session which was held at Idaho City immediately preceding the opening of the project.

The project director and Forest Service contracting officer contacted Region 1 and Region 6 personnel who were experienced in timber spray operations and included their recommendations in the contract safety requirements. Advice also was solicited from Archie Gieser, Agricultural Research Service, C. A. A., and Idaho State Bureau of Aeronautics officials.

Entomological reports were received on May 20 that butterfly eggs were hatching rapidly because of abnormally warm weather. The project had originally been scheduled to open about June 10. Contract bids were flexible enough to permit beginning the project earlier than anticipated and the contractors were notified that it would be necessary to begin operations not later than June 7.

In order to complete the project within the time available it was necessary to authorize overtime for the Forest Service personnel to work Saturdays and Sundays. According to flight contract requirements spraying was permitted for continuous six-day periods with one day lay-off. However, to correlate spray checking and insect checking by flight areas, some overtime work was necessary.

Prior to beginning operations the project safety officer and director drew up a comprehensive safety plan covering all phases of the operation in detail. Rigid safety requirements were written into the spraying and insecticide contracts, drawn both from contracts on previous jobs in Regions 1 and 6 and from an analysis of the factors peculiar to this project.

SAFETY

Safety was recognized as highly essential to the project's success. As a result no one on the project, either Forest Service or contract personnel, suffered bodily injury and there were no lost-time accidents, an enviable record made possible by leadership and strict attention to safety by everyone. This was the first major airplane spraying project completed by the Forest Service without a personal injury.

All temporary personnel who would be driving Government or private vehicles took the standard driver's training examination and were given licenses prior to opening of the project.

The hazards inherent to the project were carefully analyzed at the training session and the safety organization was thoroughly discussed so that each man understood his responsibilities. A safety committee on each control unit plus a weekly meeting for all personnel kept the program and the importance of safety continuously in the limelight. Each one had plenty of opportunity to give suggestions for improvement and assume safety leadership thus creating the desirable atmosphere that it was everyone's program and that everyone was responsible.

One subcontractor suffered a crackup of his Stearman airplane due to a forced landing caused by engine failure following a broken valve spring. The plane was wrecked but the pilot's crash helmet and shoulder harness protected him from injury.

Insistence on pilots wearing approved crash helmets and shoulder straps is undoubtedly one of the best safeguards available. Strange as it may seem some pilots require close supervision in this respect.

A safety signalman was necessary at Warm Springs airstrip. A roll in the ground level prevented complete view of both ends of the strip.

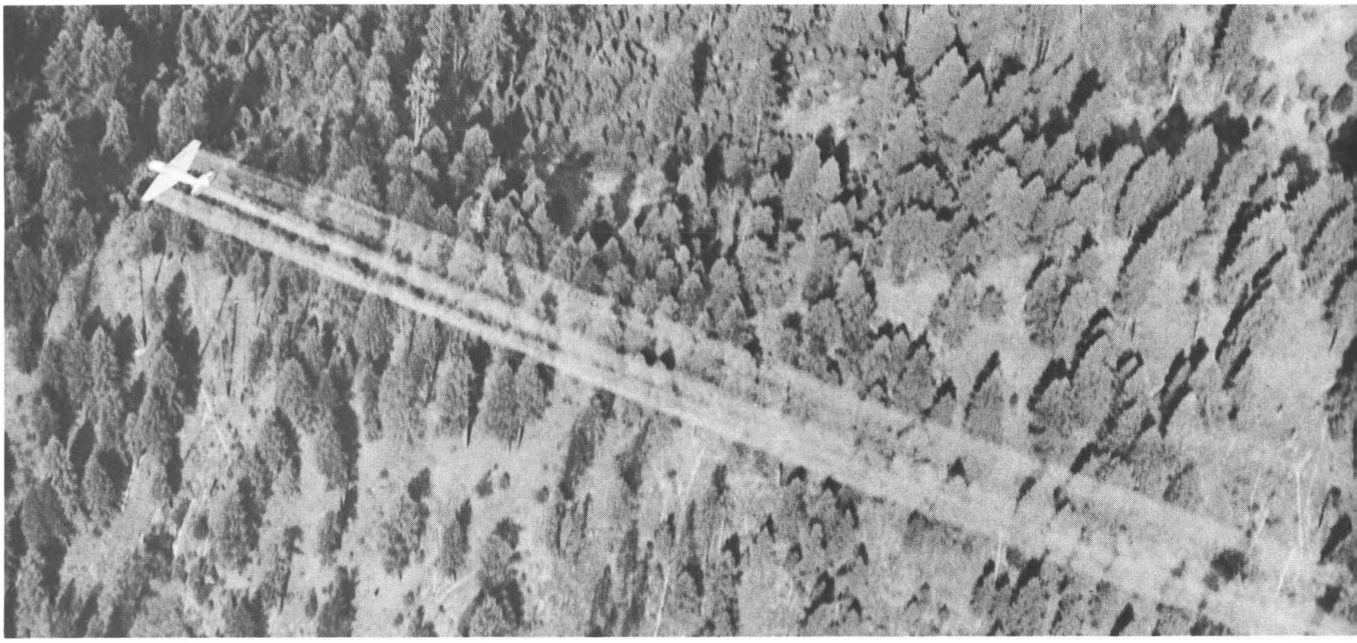
CONTROL UNITS

Division of the project into the Idaho City Unit No. 1 and the Warm Springs Unit No. 2 proved practical from the standpoints of length of flight, loading facilities and the extra plane safety obtained by reducing the number of aircraft operating from one field.

Aerial master mosaics made from photos obtained from the regional office files aided materially in outlining spray blocks in each control unit and the timber areas to be sprayed. These unit mosaic maps mounted on 1/4" plywood were used to plat daily flight progress at each base. In addition, pilots were provided with air photo maps of the individual spray block assigned to them to be used as a guide for their flight paths. The pilots' air photo spray block maps were mounted on cardboard and, as an additional check on terrain and drainage, base maps of the same scale were placed on the reverse side.

Left to right: Project Entomologist Leslie Orr, Warm Springs Unit Base Supervisor Ed Noble, and Pilot N. W. (Swede) Ralston check the day's flight on a spray block airphoto map.

The division of infested areas into units and spray blocks was based upon topographic and other features such as roads and creeks which could be easily used as guides by the pilots flying the area. Spray blocks varied in size from 1,000 to 14,000 acres depending on topography and the type of plane that could be used in the area.



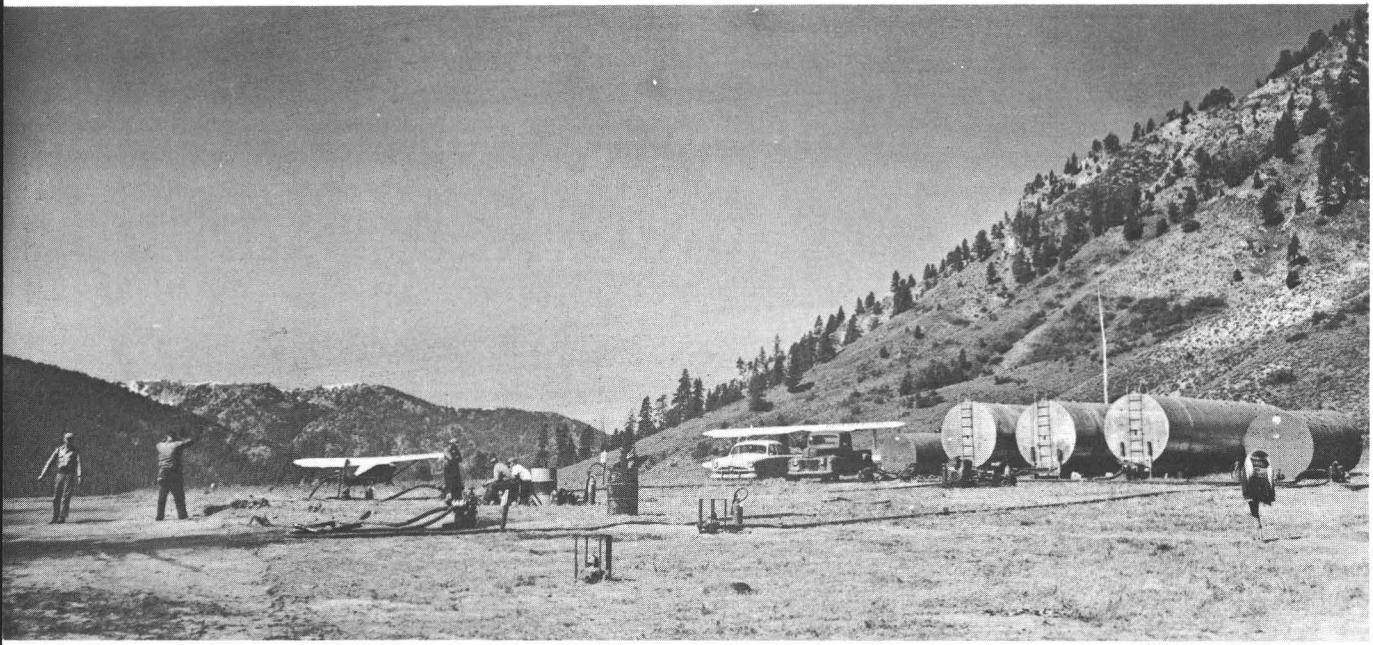
In the Clear Creek block Pilot Swede Ralston lays down a spray blanket from his TBM converted Navy Torpedo Bomber.

A variation of two to three thousand feet in elevation within the units exerted considerable influence on the rate of egg hatching and larval development and this factor had to be carefully considered in determining the order of spraying. Entomologists kept close watch on insect progress and coordinated the selection of blocks to insure spraying at the proper and most effective time. For the most part spraying proceeded from the lower, warmer elevations upward although this did not prove to be a hard and fast rule because development on southern exposures in the higher elevations was found to be at about the same rate as that on northern exposures in the lower areas.

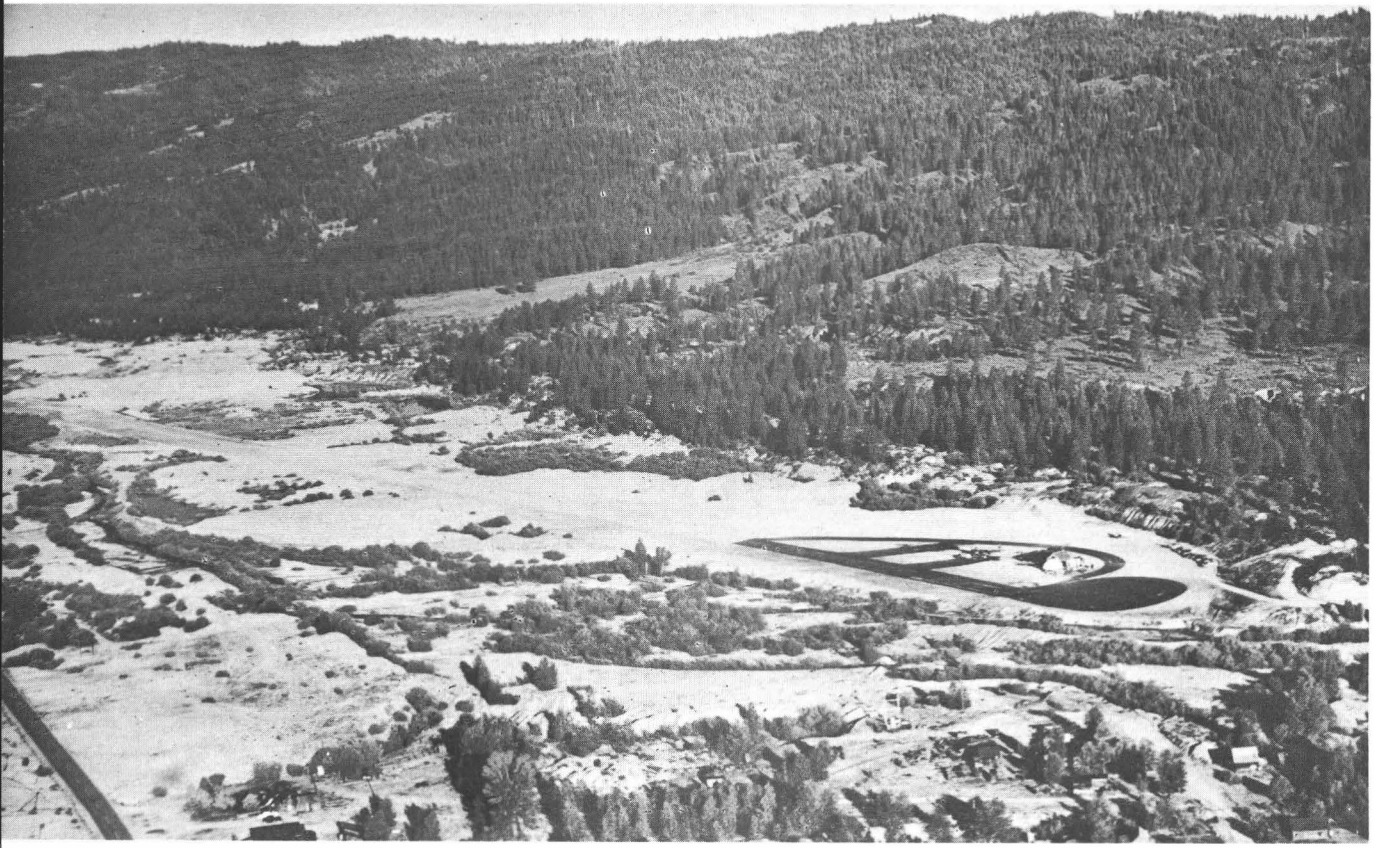
AIRCRAFT, EQUIPMENT AND SUPPLIES

Individual contracts covering the three essentials for the project (aircraft, insecticide, and transportation and storage of the insecticide) were drawn up by the regional supply officer in cooperation with the project director and project safety officer. Considerable aid was obtained from similar contracts previously issued on spruce budworm projects in Regions 1 and 6.

The Johnson Flying Service, Missoula, Montana, was awarded the contract for flying the Idaho City Unit. Ball-Ralston Flying Service of Hillsboro, Oregon, was low bidder on flying the Warm Springs Unit. Contract for insecticide was awarded to the Pennsylvania Salt Manufacturing Company of Portland, Oregon. Portland Motor Transport Company was the successful bidder to provide storage facilities and deliver the insecticide at Idaho City and at Warm Springs.

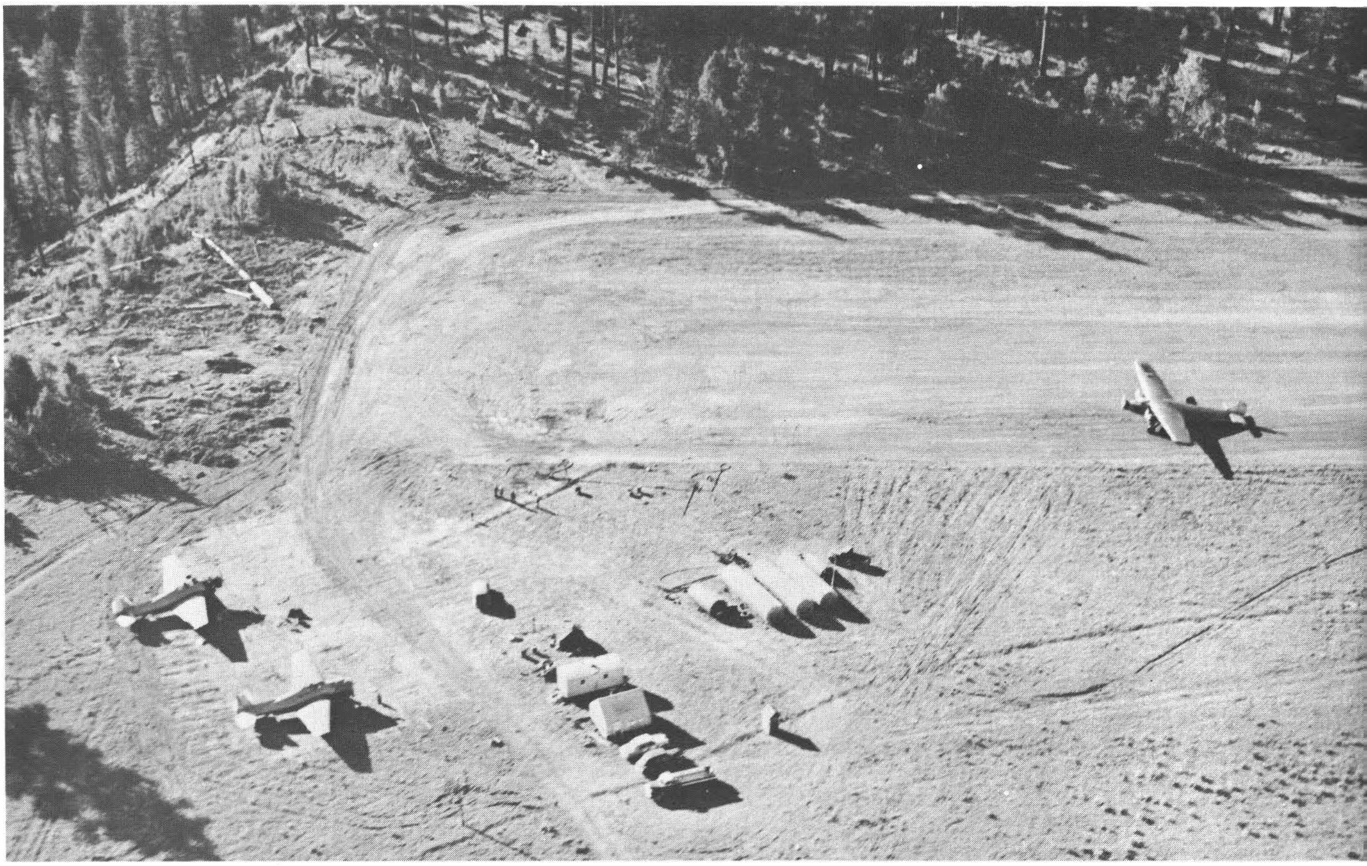


Storage tanks and plane loading facilities installed at Warm Springs airstrip by the Portland Motor Transport Company.



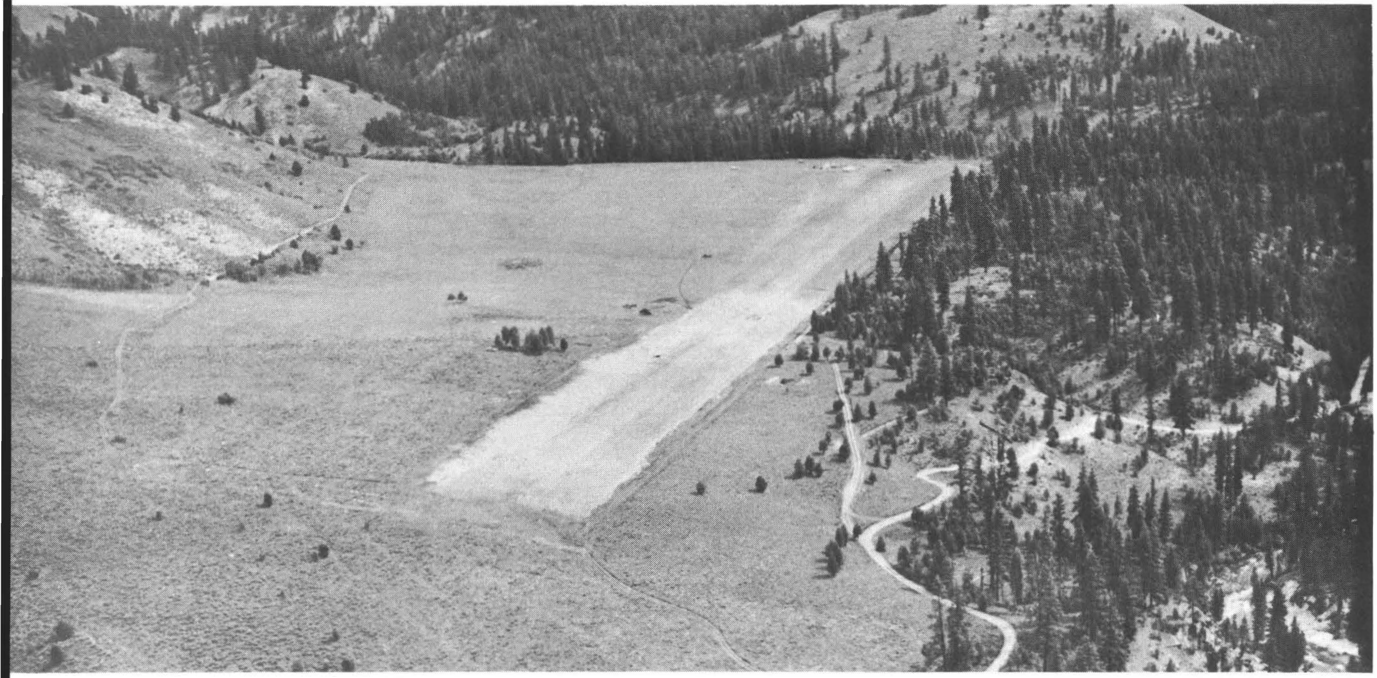
Idaho City Airport showing oil pattern laid down in plane loading area.

The Idaho City Unit was sprayed with planes based at the Idaho City airport. Some improvements had already been made there to facilitate use of multi-engine aircraft in connection with servicing the smokejumper unit at Idaho City. However, to handle the DC-3 type plane and two Ford Tri-motors some additional oiling was necessary with heavy road oil MC No. O, of the type used by the local counties, to make a smooth durable surface and eliminate the dust hazard. This was essential particularly in the plane loading area. The field has an elevation of 3700 feet and has a single runway 3000 feet long.



The project layout and loading area at Warm Springs airstrip.

The Warm Springs airstrip, elevation 4200 feet, length 3000 feet, single runway, was developed by the Forest Service in cooperation with the State of Idaho as an emergency landing field for the numerous small aircraft which travel in the mountainous areas and for use in connection with smokejumping activities. Constructed in 1953, it was still quite rough and additional smoothing was necessary to handle the spraying aircraft efficiently and safely. The dust hazard was handled by sprinkling with a tanker truck as needed.



View of Warm Springs Airstrip - lower end.

View of Warm Springs Airstrip - upper end.

One contractor operated two Ford Tri-motor airplanes and one Douglas DC-3. Each Ford carried approximately 420 gallons of insecticide, and the Douglas 1,000 gallons. The Douglas had originally been assigned the gentlest areas on Unit 1, with the expectation that the more rugged terrain would be worked out with a Ford Tri-motor. It developed that the Douglas was able to spray the entire rough area without help and accomplished the job in less than half the time it would have taken both Fords. No accidents, engine failures, or near misses occurred during the operations on this unit.

The other contractor started the project with two T. B. M. Navy torpedo bombers and one Stearman. One of the T. B. M. 's developed engine trouble shortly after arriving on the job and, after taking out several light loads, was grounded for the duration of the project. The other T. B. M. had an engine failure when the project was about half completed. A new engine was installed at the Warm Springs airport and after meeting the minimum standards for flying time, the plane continued with the spraying operation. The Stearman had an engine failure on June 18 and was demolished during an emergency landing. The contractor procured three additional airplanes in order to complete the assignment.

No injuries occurred to any member of the ground crew or flying personnel.

The engine failures that resulted in forced landings pointed out the need for revision of contract specifications and standards applying to aircraft engines. The past record of the accidents in tree spraying in the States of Washington and Oregon showed that engine failures were also the major cause of accidents there. Present requirements for engine overhaul and maintenance are not adequate. Suggested changes are as follows:

1. Standards should be worked out and included in the spray contract for war surplus or other airplane engines that have been stored or out of service for a year or more.

2. The bid contract should provide that the contractor furnish satisfactory evidence of engine overhaul.

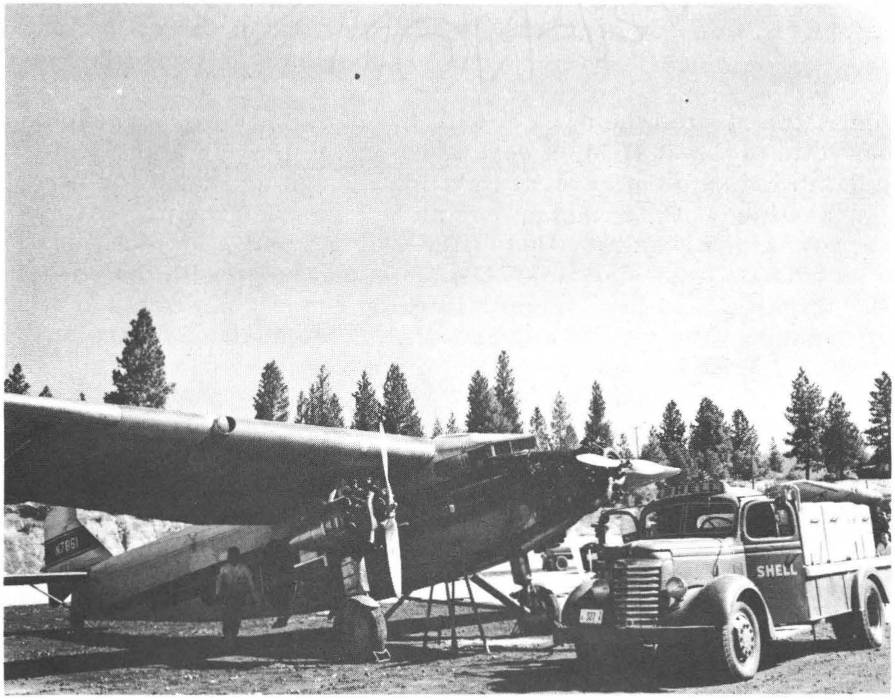
3. Careful consideration should be given to the use of multi-engine aircraft wherever practicable in the interest of safety. There is need for further study on the comparative safety and efficiency of multi-engine planes as against small planes in rough mountain country.

4. All bids should allow for modification of contract clauses relative to airplane and engine standards whenever it is in the best interest of the Government to do so.

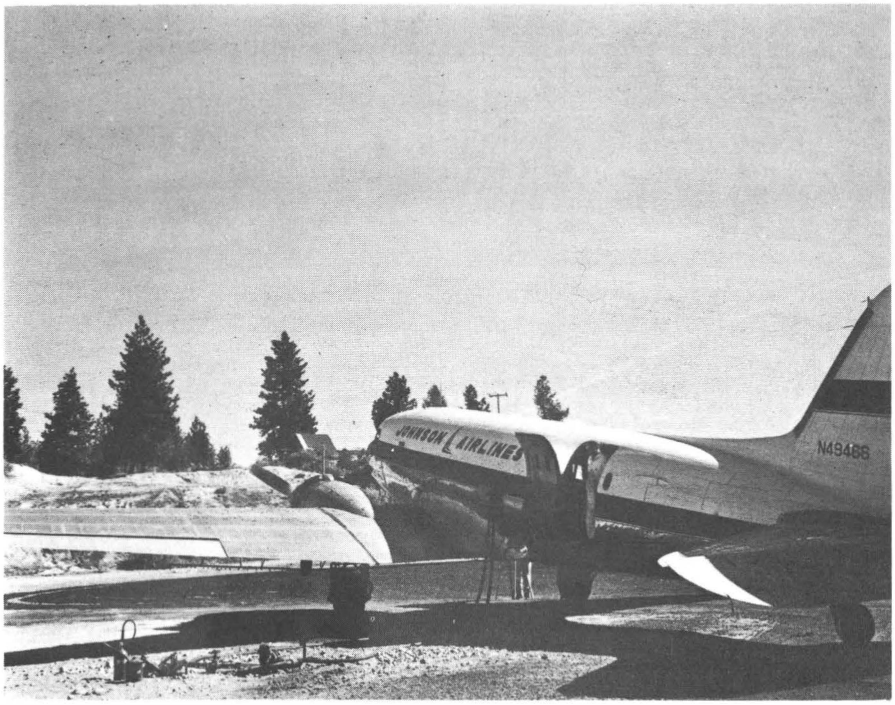
5. Discretionary authority should be available for rejection of bidders on safety considerations.

Contract aircraft operated from the Idaho City airbase by Johnson Flying Service were:

	Insecticide Capacity in Gallons
1 DC-3 (C-47)	1,000
2 Ford Tri-motors	425
1 Curtis	Observer Plane


N7861
SHELL

Refueling a Ford Tri-motor at Idaho City Airport


JOHNSON AIRLINES
N49466

Reloading the DC-3 at Idaho City Airport

Contract planes based at the Warm Springs airstrip operated by the Ball-Ralston Flying Service were:

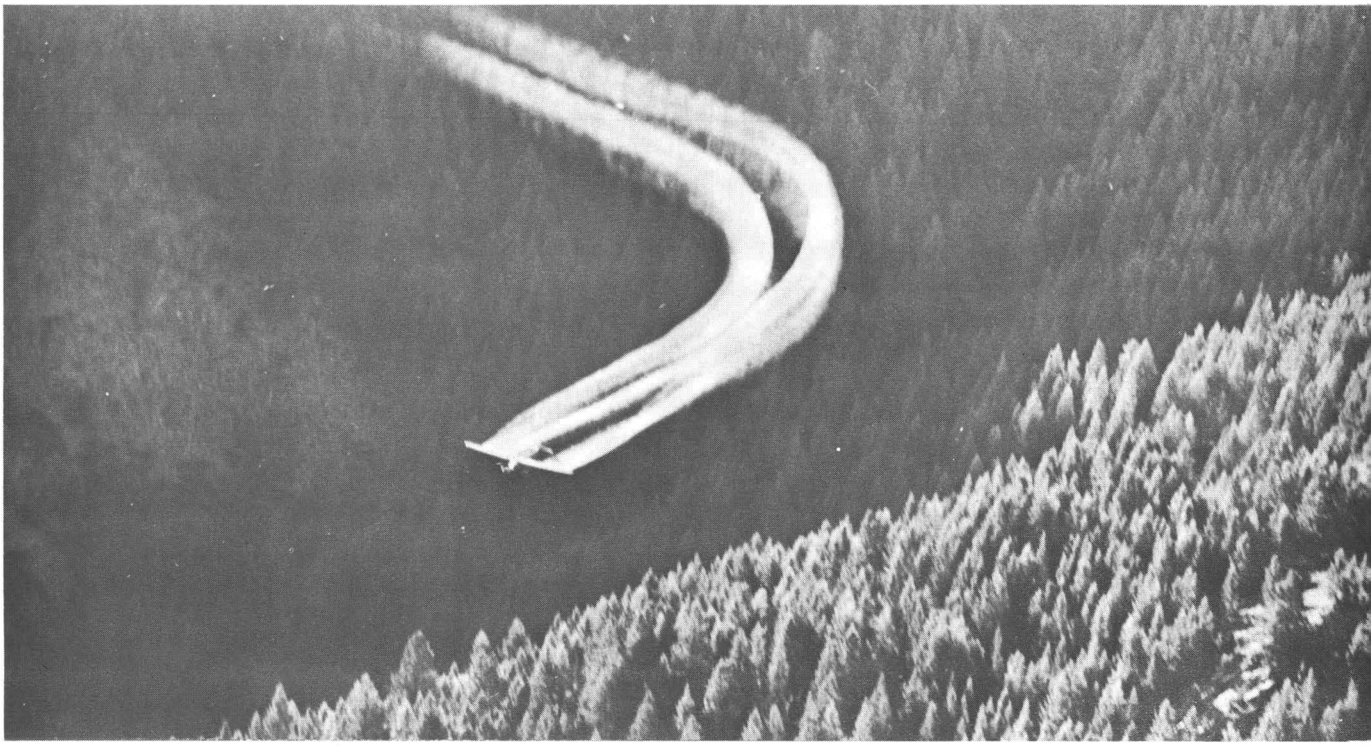
		Insecticide Capacity in Gallons
2	TBM - Heavy Torpedo Bombers	700 (each)
1	Stearman	125
1	N3N Navy Trainer	125
1	Fairchild "71"	150
1	Ford Tri-motor	375
1	Piper Pacer	Observer Plane

Reloading the Fairchild at Warm Springs Airstrip

Reload and motor check on N3N at Warm Springs airstrip.

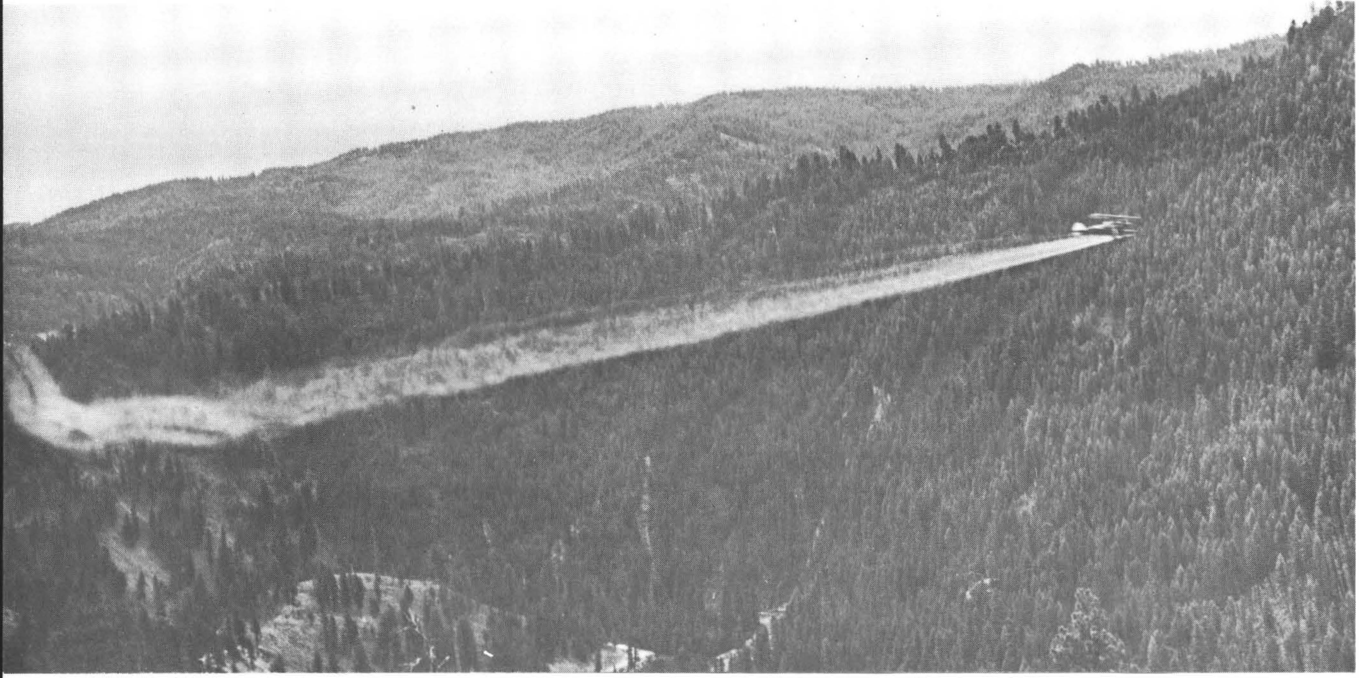
The two TBM's at Warm Springs undergoing checks and repairs.

It was the consensus of project personnel that the DC-3, TBM's and Fords flying higher above the timber were able to secure better spray coverage than the smaller ships. Because of its relatively higher speeds the DC-3 was top performer on the project in acreage. The Ford Tri-motors can be operated in rough terrain equally as well as the smaller planes and, of course, can cover more acreage under similar conditions.

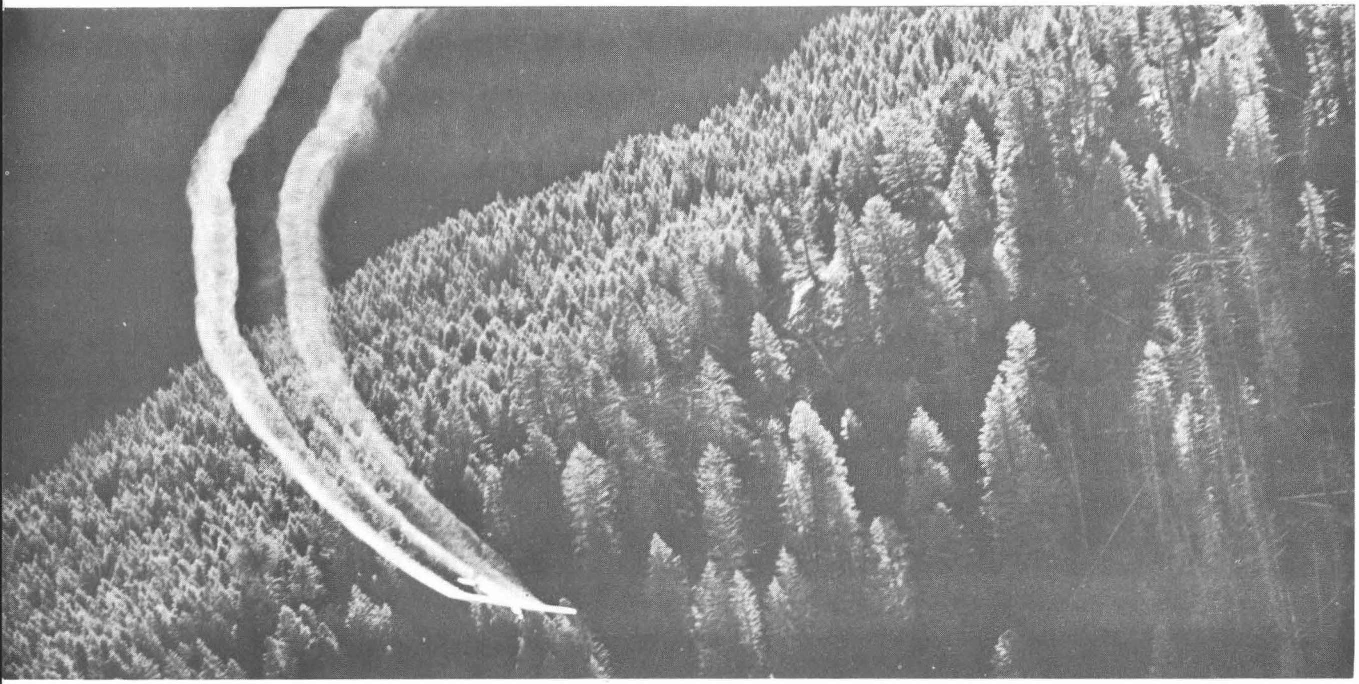


The Ford Tri-motor lays down an effective screen of insecticide. It operates economically and is very maneuverable at low altitudes and in rugged topography.

Smoke markers used by the Johnson Flying Service were of considerable aid to the pilots. Markers are made by using an oil dilution type valve system to inject spurts of oil into the exhaust stack. The smoke streamers hang in the air longer than the insecticide spray cloud and serve to orient the pilot quickly on his return swath.



Stearman plane spraying.



Ford Tri-motor working in rough terrain. **Light** conditions in this photo overemphasize spray pattern and obscure timber in shadow.

The observer pilots at Warm Springs and Idaho City were in continuous service, particularly during border weather conditions, to check air turbulence, height of spray plane above the tree tops and spray pattern. They were in radio communication with the unit supervisors at all times to report dangerous flying conditions and ineffectiveness of spray due to wind drift.

Pilot Clare Hartnett with the Piper Pacer used in observer operation on the Warm Springs Unit.

According to terms of the contract observer planes and pilots were provided by the contractor. On the Warm Springs job Forest Service Pilot Hartnett, employed as an observer, preferred to do the dual job of piloting the plane and acting as observer. This was permitted and worked out very satisfactorily.

Future contracts, if desired, could be revised to permit agency pilots to operate observer ships provided by the contractor or furnished by the project.

Archie Gieser, of the Agricultural Research Service, was cooperating spray technologist on the project. He rendered invaluable advice and assistance in calibrating the equipment to deposit the insecticide at the specified rate of one gallon per acre and also spent considerable time on the project in an advisory capacity on aircraft operation and mechanics. His unique experience and his knowledge of planes and operational techniques elicited respectful attention and response to his suggestions from contractor personnel.

The average temperature set by contract for delivery of the insecticide from tank cars into tank trucks was 60 degrees F. and payments were made on this basis regardless of the loading temperature. Gallonage delivered was slightly higher at temperatures above 60 degrees and slightly lower during cooler weather.

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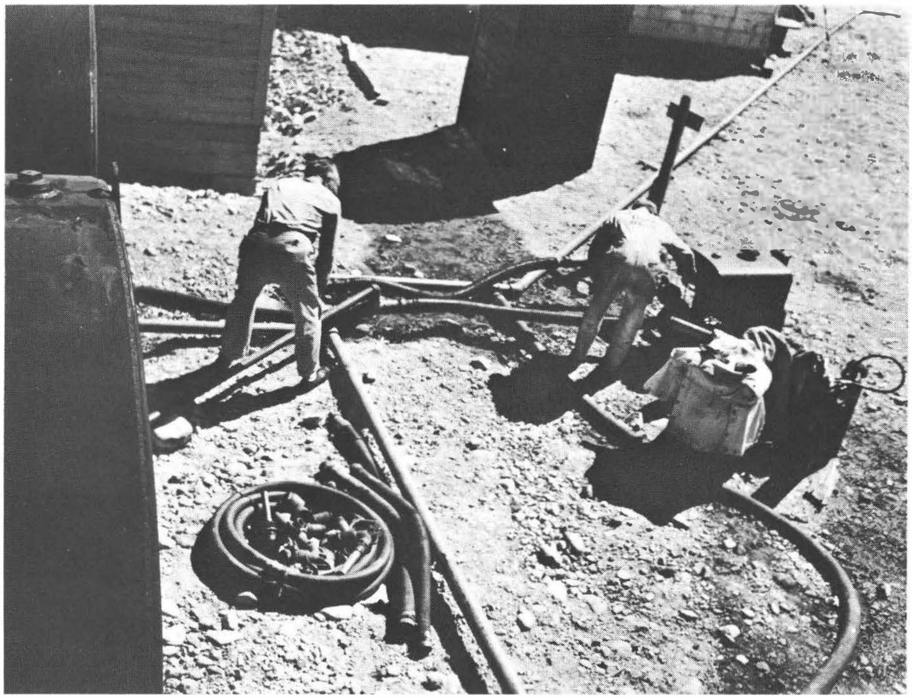
INFLAMMABLE

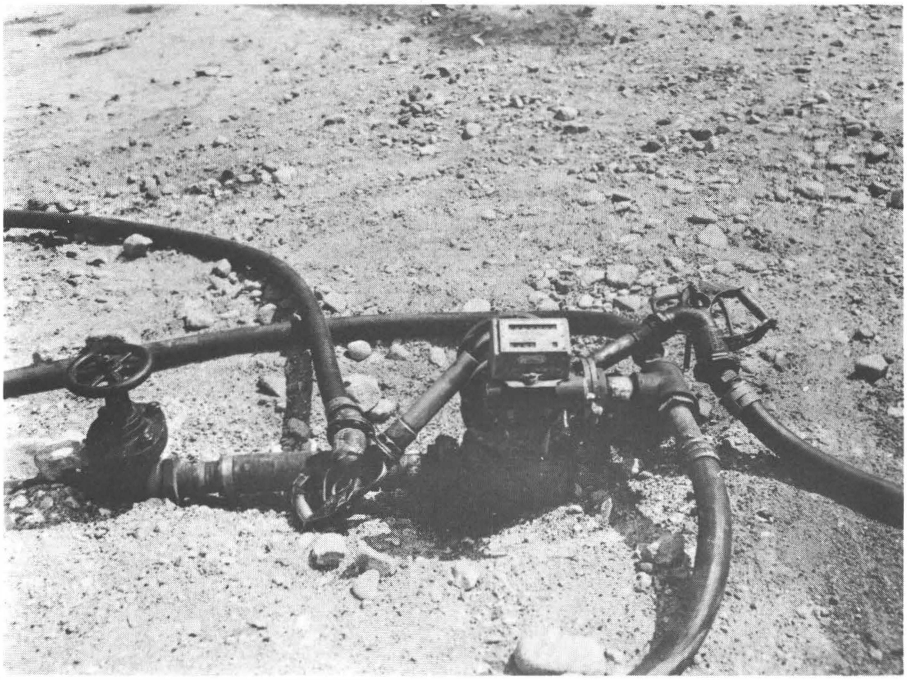
Tanker truck unloading insecticide at Idaho City Airport into one of the 10,000 gallon storage tanks.

Insecticide concentrate was delivered to Boise by rail in tank cars. It was then diluted with No. 2 fuel oil and hauled to the airstrips in tanker trucks and trailers with 2800 and 2600 gallon capacities, respectively. The specified contract ratio of not less than 1.00 pound of DDT per gallon of finished insecticide was checked for each batch. The Forest Service sent a pint of each batch of finished insecticide airmail to Dr. W. E. Westlake of the Agriculture Research Service at Yakima, Washington, who made the analysis and telegraphed the results back to Boise National Forest headquarters. For a double check, the Pennsylvania Salt Company also sent samples to their chemist at Portland. Both chemists concurred in results before a batch was accepted.



Mechanic adjusts the pump used for unloading tank trucks and for pumping insecticide into the planes.

The Portland Motor Transport Service supplied all facilities for transporting the insecticide from the Boise rail delivery and mixing point to both units, provided 40, 000 gallon tank storage facilities at Idaho City, 30, 000 at Warm Springs, and furnished the metering and pumping units for unloading the fluid from the trucks into storage, and from there into the airplanes. Meters were properly calibrated before installation and the plane contractors were paid on the basis of gallonage delivered through the meters into the airplanes' insecticide tanks.



Type of meter installed by the Portland Motor Transport Company to measure amount of insecticide loaded into planes.

Fuel for the airplanes was furnished and hauled to the project at the expense of the contractors who also provided fire fighting equipment and other safety devices in the loading area and in the ships.

Three sets of meters and insecticide loading equipment were provided at each project unit as prescribed by contract. Thus, each operating aircraft had its own reload station to avoid confusion at the field and permit more rapid get-away time.

SPRAYING OPERATIONS

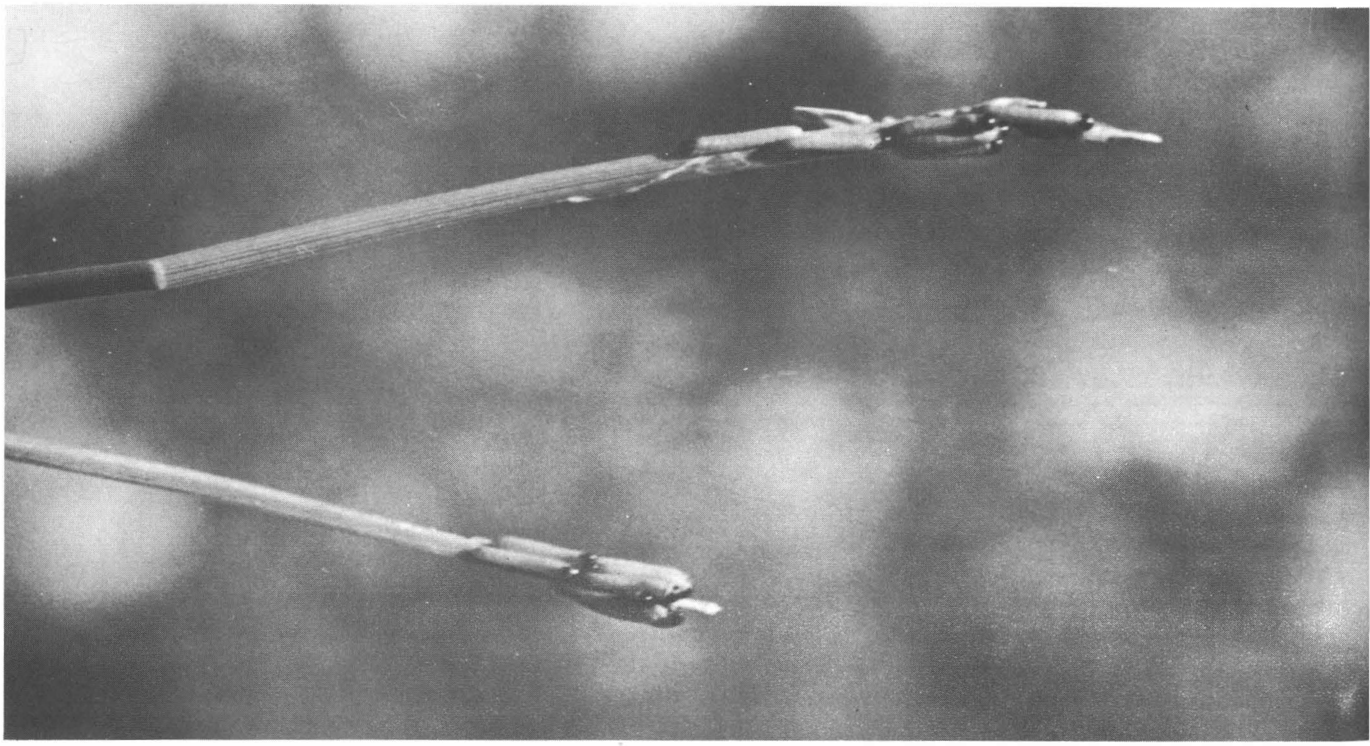
At the time spraying operations first got underway nearly all of the butterfly eggs had hatched on certain of the spray blocks. However, 14 days of cold rainy weather beginning early in the month delayed further larval activity until June 16.

It was found that an excellent kill was obtained even under damp, humid forest conditions with considerable moisture on the foliage. No spraying was done, however, immediately following rain when trees were dripping due to unsafe flying conditions and uncertainty as to the effectiveness of the spray.

Because of the "break" in weather conditions which held back larval development it was possible to complete most of the spraying while larvae were in the first and second instars. Damage from 1954 larval feeding was, therefore, very slight. Although there was no previous experience in spraying larvae at these early stages in their development it was found that mortality was excellent. This fact may serve as a guide on future operations.

Another interesting angle of the project was the incidental kill secured on some severe infestations of spruce-budworm in Douglas fir, where they occurred in mixed stands with the ponderosa pine. In order to accomplish this "double-duty" kill the project entomologist arranged the "order of spray" to make application coincide with the proper stages of larval development for both insects insofar as possible. Spruce-budworm larvae spend their early stages within the new buds where spray droplets cannot reach them. As the buds open they feed among the new needles. When the needles spread the larvae become more and more exposed to contact with the spray. It was the correlation of this vulnerable spot in their development with the application of the spray that accounted for a budworm kill which reached as high as 90 percent in some areas. However, in most areas operations were completed before development of the budworm to an ideal stage for spraying.

Just after hatching, the pine butterfly larvae tend to cluster for feeding in groups of six to ten or more around the tips of the needles in a more or less circular arrangement. In too many instances to be considered chance, a kill of all but three or four of the larvae by spray resulted in drowning of the others by resin flow from the ends of the needles. In this way the physiological processes of the trees aided materially to supplement the effects of the insecticide. Such a combination of factors would be impossible when the larvae reach the third and fourth instars and begin to feed individually. This is another point in favor of applying the spray during the first and second instars.

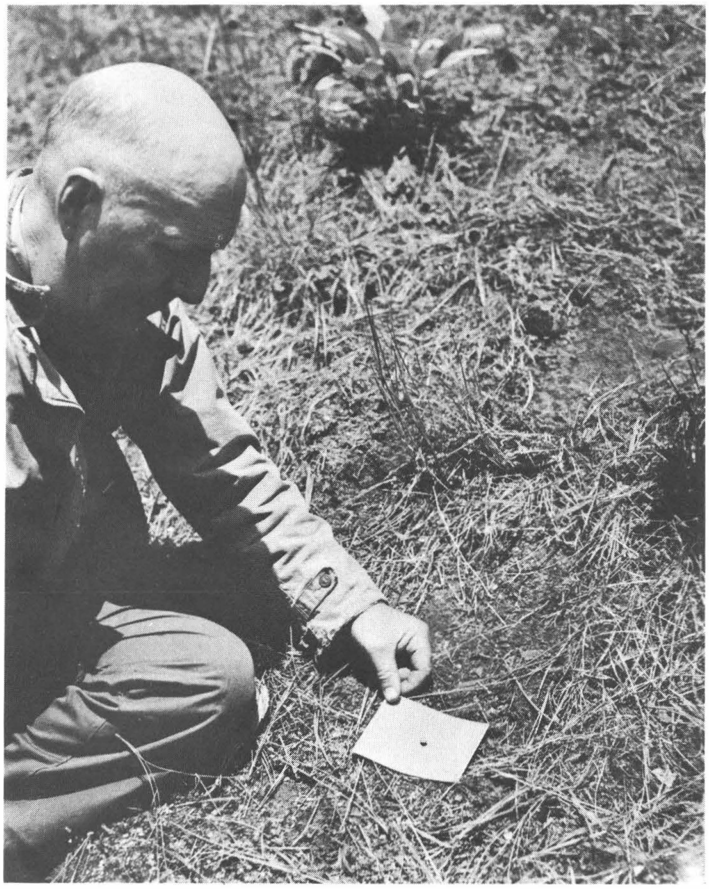


The first and second instar larvae tend to group in a circle around the top of the pine needles and feed downward.

Checking the spray job to measure both distribution of droplets and larval mortality was correlated with the order of spray, block by block.

For measuring spray distribution, 4" x 5" cards covered with an oil soluble dye were placed in the spray areas just before they were flown. A systematic arrangement of one card in an open area every two chains along string lines at right angles to the spray swaths gave a systematic basis for evaluating the deposition of droplets. Standard sets of cards showing distribution of droplets for various intensities of application were provided by the Forest Insect Laboratory at Beltsville, Maryland, together with a supply of blank cards for the project.

The spray checkers laid 26 miles of cards at 2-chain intervals on the 26 blocks sprayed in the Warm Springs Unit and 25 miles of cards on the 15 blocks in the Idaho City Unit. Some spray blocks were inaccessible to foot travel because of high water and lack of roads. Air observers checked the deposit of spray in these remote areas.

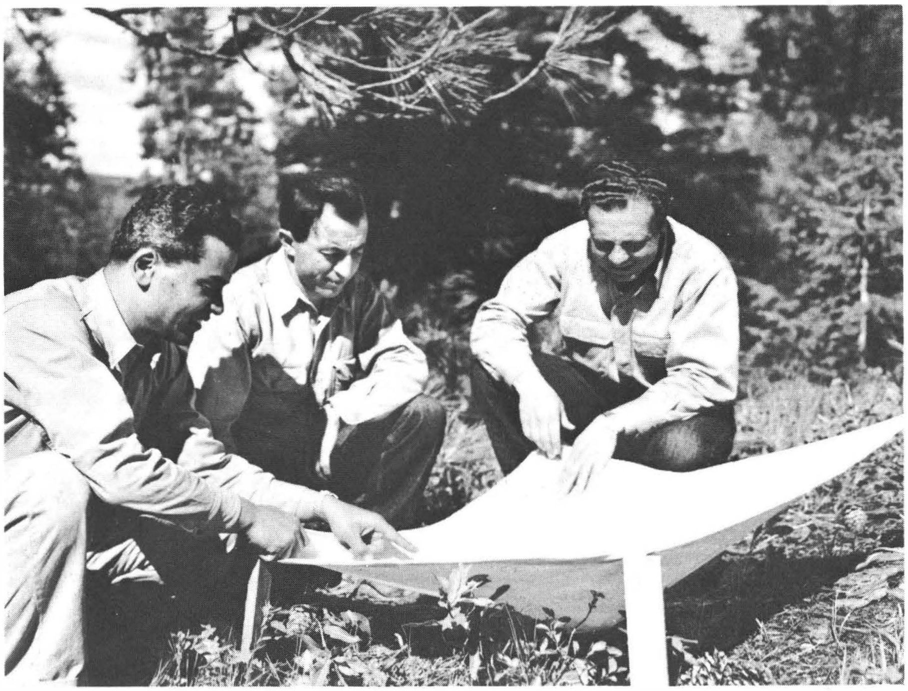


Leslie Orr shows method of placing the spray check cards in an open area. A nail or small twig is used to hold them in place.

During the wet weather in the early stages of the project it was found that the rain and sun combination faded and bleached the cards and erased any visible evidence of spray deposit. A spray checker who had previous experience as an oil driller suggested the possibility of using ultra-violet light to detect oil traces on the cards. The method was tried and it was found that under the light the pattern of oil droplets showed up very well.

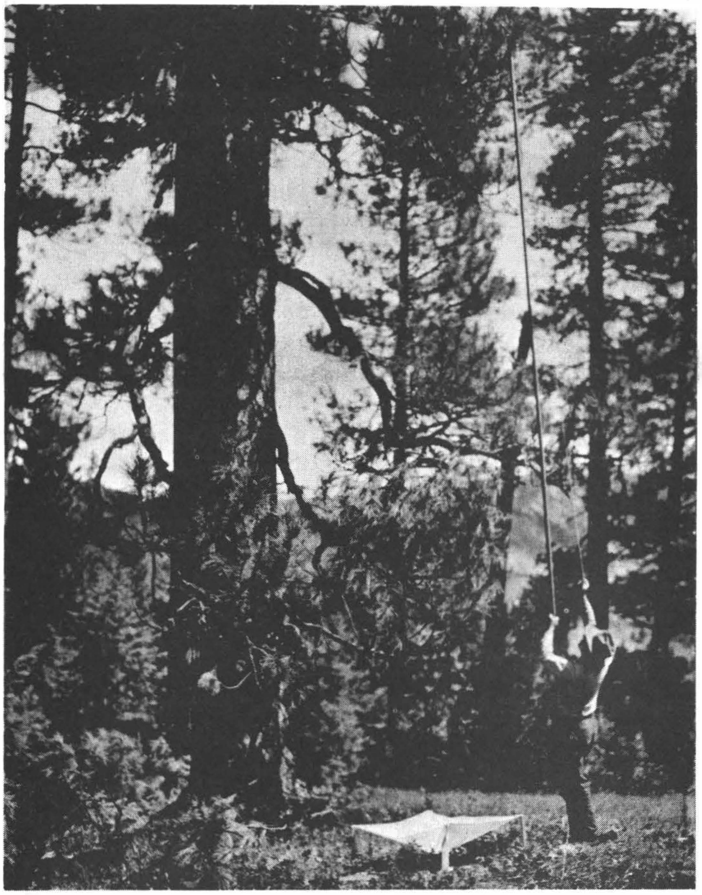
There is need for improvement in the check cards to permit their use during wet weather. The dye is very soluble in water and is subject to fading in sunlight.

In addition to checks on the spray deposition, crews placed a series of yard-square muslin cloth trays at 5-chain intervals in a sufficient number of control blocks to obtain counts on larval mortality. Like the card lines the trays were placed near string lines laid down at approximately right angles to the flight paths. The trays were placed beneath the outer branches of the trees to catch dead and dying larvae and counts were made on the first, third and fifth day after spraying. It had been planned to check for ten days after spraying as on other projects, but this was not necessary because in every case kill was complete by the fifth day.



One of the muslin trays mounted beneath the tree branches to catch dying larvae is inspected by three Turkish foresters who visited the project.

To secure a mortality ratio the insect checkers also made clippings of terminal branches on selected trees along the string lines before and after each block was sprayed. The larval counts on these clipped twigs and needles before and after spraying indicated practically complete mortality on treated areas. No need for further butterfly control is anticipated for any portion of the treated areas.



Method of clipping a terminal twig from check pine tree to count living larvae remaining.

RECORDS

Daily progress, flight, weather, plane check and storage records developed for spruce-budworm control projects in Regions 1 and 6 and modified somewhat to fit the operation proved very helpful.

Individual load sheets by spray blocks for each plane showed the date of flight, takeoff, return and flight times, insecticide load in gallons and gasoline used. These sheets kept up to date by the load checkers plus a daily summary of use and inventory of insecticide provided the basis for the base supervisor's daily progress report. His daily summary showed (1) acreage sprayed today, (2) acreage previously reported, (3) total unit acres to date, (4) acreage remaining, (5) flying time, and (6) gallonage of insecticide on hand, thus providing him with a basis for on-the-spot progress reports and for maintaining an adequate supply of insecticide.

The fact that the load checkers also kept close tab on the planes' gasoline levels provided a double check to the safety of the project even though the pilots too were very much aware of their fuel supplies at all times. Contracts specified the fuel levels to be maintained in all types of planes used. There were no violations and no instances of planes running short.

After each day's flight period the pilots marked with various colored grease pencils their flight strips on the large mounted airphoto mosaic, giving in effect a picture of progress for the benefit of the project personnel and visitors.

The daily records also showed weather conditions as reported at one-half hour intervals by the unit weather observers. These reports controlled the flight periods which began at 4:20 to 4:30 a.m. and continued until temperatures reached 65° F. or wind, 6 miles per hour. Spraying never extended beyond 11:00 a.m. and usually ended about 9:30 a.m.

PUBLIC RELATIONS

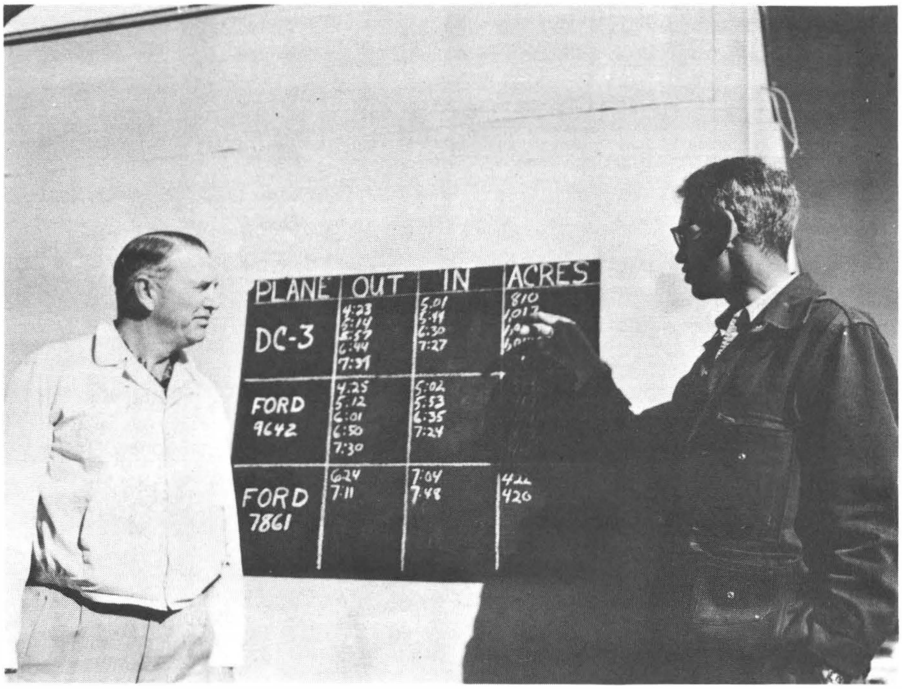
Any large national forest project which has such an important bearing on local economy is of great interest to the public and it was, therefore, essential that everyone be thoroughly informed, particularly in the communities adjoining the project operation.

A special effort was made to get widespread dissemination of the essential facts to the public both before and during the operation.

A small booklet outlining the facts about the pine butterfly outbreak was prepared and given wide distribution to all agencies and individuals closely involved in the project. Copies were also given to visitors to the project, and local places of business likely to have inquiries, and to newspapers and other publication editors.

Publicity was released to the local newspapers and to the U. P. and A. P. wire services when the project began, and daily to keep them informed of developments. Local newsmen and radiomen carried up-to-date accounts of the operation to the public.

Due to the active interest in the control project by many individuals and groups, it was found necessary to plan for considerable show-me work.



PLANE	OUT	IN	ACRES
DC-3	4:23 5:14 5:57 6:44 7:31	5:01 5:44 6:30 7:27	810 1017 [illegible] [illegible]
FORD 9642	4:25 5:12 6:01 6:50 7:30	5:02 5:53 6:35 7:24	
FORD 7861	6:24 7:11	7:04 7:48	[illegible] 420

Idaho City Base Supervisor Mel Coonrod (R) shows Governor of Idaho Len Jordan the blackboard used to record plane schedules and accomplishments.

The project personnel gave visitors a thorough understanding of the operation and of its importance to the timber and other resources. A special "show-me" board including materials, forms, and maps was prepared at the Idaho City airport to use in explaining project details. All visitors seemed highly impressed with the smoothness and efficiency of the project and especially with the excellent results being obtained.

Chet Moulton of the Idaho Aeronautics Department secured some motion pictures of the spraying to incorporate in one of his films.

Members of the Southern Idaho Forestry Association visited the spraying operation and observed the effects of the spray on the pine butterfly larvae. The photo shows lumber industry representatives Shellworth, Woody, T. Hoff, Jr., Mitchell, Brassey, Hettinger, Rhodes, V. Guernsey, Anderson and Aram. State Forester Roger Guernsey represented the State and Art Roberts the Southern Idaho Timber Protective Association.

MISCELLANEOUS FINDINGS

1. Air photos of the control units for the base supervisors and of spray blocks for the pilots were of material aid. They were used to lay out unit project progress maps and helped divide the control units into logical operating areas. Master progress maps for each unit were mounted on 1/4" plywood. Pilots' individual spray block unit photos were mounted on cardboard with corresponding base maps on the reverse side.

2. Close correlation of the technical and administrative workers was essential to assure spraying each area at the proper time for best results.

3. Oil coating on the airstrips especially when large planes were to be used was highly desirable. Smooth, well-packed runways with provision for sprinkling reduced the dust and operating hazards to a minimum.

4. Contracts should be studied and analyzed very thoroughly for standards and safety. They should contain specific clauses on engine maintenance and acceptable overhaul requirements which may now be improved as a result of experience.

5. Multi-engine aircraft proved safe and efficient for this kind of work.

6. Oil dilution valves to make smoke markers on the spray strip apparently were effective aids where used.

7. A good mountain flyer can operate an observer plane and do the observing job at the same time.

8. A qualified spray technologist is an invaluable aid to these projects. The Forest Service should have a close working agreement with the Agricultural Research Service so that an ARS man can be assigned continuously for the duration of all projects. This service proved so valuable that no similar project should be undertaken without the mandatory requirement of utilizing ARS cooperation and technologist guidance.

9. Dampness and some moisture on the foliage did not reduce the effectiveness of the spray. However, the trees should not be dripping.

10. Pine butterfly larvae sprayed when in the first and second instars were particularly susceptible. The resin flow from the needle tops will drown the young larvae if only two or three per needle are left following spraying.

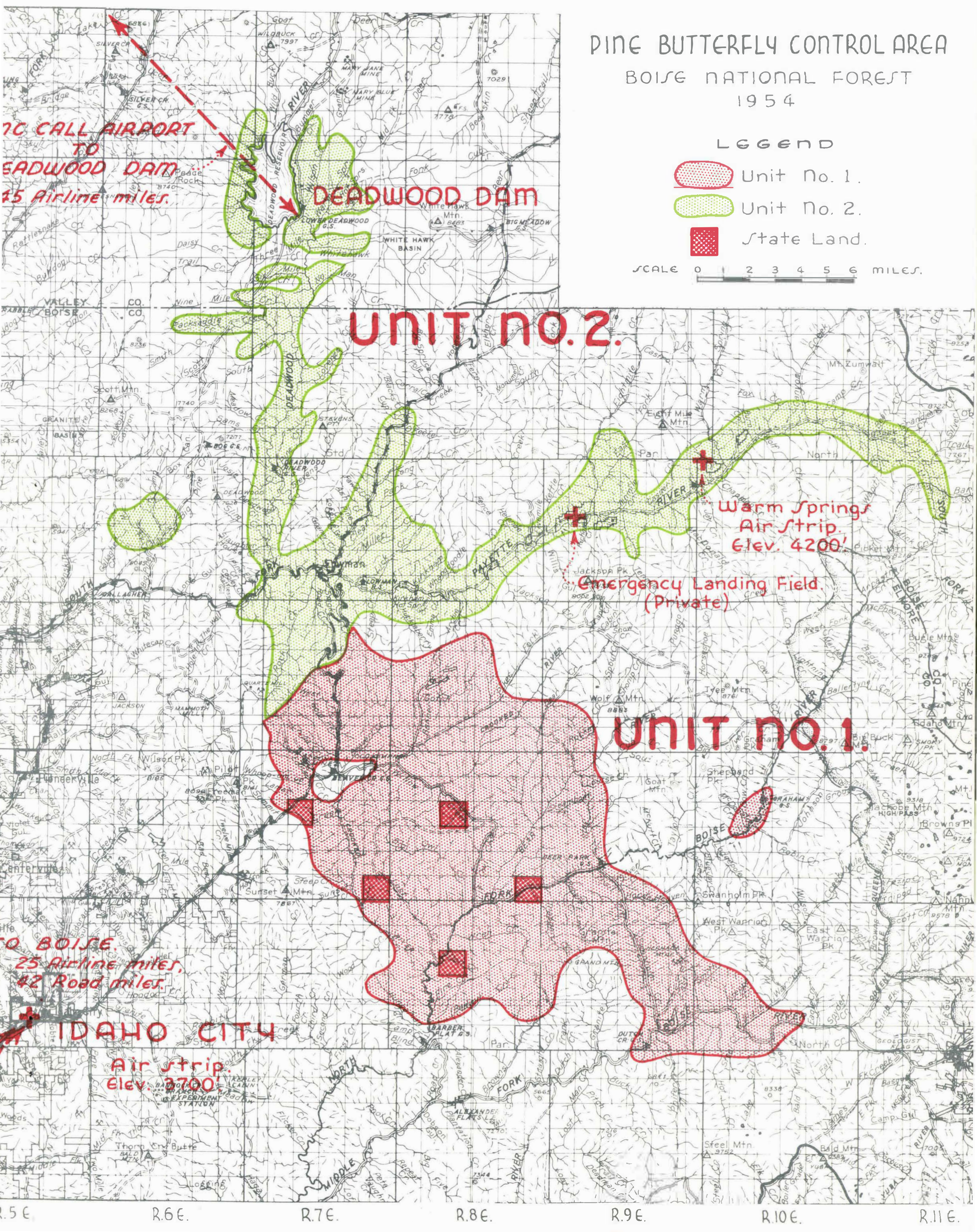
11. A full-time project safety officer contributed much to safety success. Such an assignment should always be provided in comparable future projects.

12. Provision should be made for communication between the insect checker crews and the unit supervisors.

13. Adequate storage of insecticide at each airstrip center was an important key to uninterrupted operation.

14. Adjacent emergency landing spots should be looked over, on the ground, by pilots who may find it necessary to make emergency landings during the spray operation.

15. Further study is needed to develop a spray deposit check card that can be satisfactorily used during wet weather.



PINE BUTTERFLY CONTROL AREA

BOISE NATIONAL FOREST

1954

LEGEND
🟥 Unit No. 1.
🟩 Unit No. 2.
▨ State Land.
SCALE 0 1 2 3 4 5 6 MILES.
C CALL AIRPORT TO EADWOOD DAM 45 Airline miles.
DEADWOOD DAM
UNIT NO.2.
Warm Springs Air Strip. Elev. 4200'
Emergency Landing Field (Private)
UNIT NO.1.
O BOISE. 25 Airline miles, 42 Road miles.
IDAHO CITY
Air strip. Elev. 3700'.
VALLEY CO.
BOISE CO.
DEADWOOD RESERVOIR
PAYETTE RIVER
BOISE RIVER
Lowman
Pioneerville
Centerville
.5 E.
R.6E.
R.7E.
R.8E.
R.9E.
R.10E.
R.11E.